

UNITED STATES PATENT APPLICATION FOR

DOCUMENT EXCHANGE FRAMEWORK FOR  
AUTOMATED EXTENSIBLE MARKUP LANGUAGE  
DATA IN AN E-PROCUREMENT SYSTEM AND METHOD

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DOCUMENT EXCHANGE FRAMEWORK FOR AUTOMATED EXTENSIBLE  
MARKUP LANGUAGE PROCESSING IN AN E-PROCUREMENT  
SYSTEM AND METHOD

5 CROSS REFERENCE TO RELATED APPLICATION

This is related to Viswanath et al., co-filed U.S. patent application Ser. No.:  
filed on \_\_\_\_\_, titled "Customizable Two-Step Mapping of Extensible Markup  
Language DATA in an e-Procurement System and Method", attorney docket No.:  
SUN/P6535/ACM/DKA. To the extent not repeated herein, the contents of this  
10 patent application are incorporated herein by reference.

FIELD OF THE INVENTION

The present claimed invention relates generally to the field of electronic  
procurement systems. More particularly, the present claimed invention relates  
15 to client aware Extensible Markup Language (XML) content retrieval and  
transformation in an electronic purchasing and procurement environment.

BACKGROUND ART

The Internet has become the dominant vehicle for data communications  
20 with a vast collection of computing resources, interconnected as a network from  
sites around the world. And with the growth of Internet usage has come a  
corresponding growth in the usage of Internet devices, wireless devices and  
services in a way different from the traditional uses of such devices.

25 The growing base of Internet users has become accustomed to readily  
accessing Internet-based services, which traditionally were restricted or limited  
to the "client/server" environment, at any time from any location. Accessibility



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fragmented, paper-intensive process that involves many forms, phone calls, and approval cycles. Just as procurement requires interfacing with multiple suppliers, it requires interacting with different areas of the organization (accounting, management, lines of business, receiving, etc.) each of which may have different processes and approval flows.

As organizations begin to embrace e-business technologies for selling goods and serving their customers online, they are also beginning to look at the efficiencies that e-commerce technologies can bring their internal procurement operations. Thus, e-procurement is quickly assuming a highly strategic role within the e-business strategies of many organizations.

With e-procurement, organizations can move the entire purchasing catalogs into a central catalog of products from approved suppliers, helping buyers quickly locate goods and services. E-procurement helps automate the formerly time consuming review process typically required to approve requisitions and initiate purchases. Finally e-procurement helps the organization realize efficiencies by accelerating the purchasing process, identifying existing inventory to minimize redundant purchasing, detecting unauthorized spending, determining purchasing patterns for improved budgeting, and ensuring contract compliance.

As the number of business applications on the Internet increases, having restricted content and very limited information about goods and services transactions over the Internet impairs the ability of purchasing professionals to take advantage of Internet technologies and provide efficient and cost effective services.

## SUMMARY OF INVENTION

Accordingly, to take advantage of the myriad of e-commerce applications being developed, an e-purchasing and e-procurement system are needed that have extensibility capabilities to allow content requests from purchasing requisitioners to the e-purchasing and e-procurement system to be formatted based on available Internet purchasing standards. Further, a need exists for a system and method of presentation formatting of content to be different from the formatting logic of the user's request to enable ready implementation of data gathered for presentation to the client. A need exists for "out-of-the-box" solutions to allow technically unsophisticated end-users to connect to the Internet and perform sophisticated purchasing and procurement decisions and activities not available in the prior art in an organization's purchasing environment without unduly tasking the end-user's technical abilities. A need further exists for an improved and less costly device independent system, which improves efficiency and provides content to various users of different configurations without losing the embedded features designed for these devices.

What is described is an e-procurement system having a portal server supporting a robust procurement system providing a wide range of features that purchasing and procurement applications require including storing capabilities for various purchasing and procurement functions in a business environment. In one embodiment of the present invention, the procurement system includes a catalog management system that integrates information from multiple external catalogs into a consolidated catalog of goods and services from approved suppliers to enable a purchasing or procurement agent to purchase items over the Internet.

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In one embodiment of the present invention, the procurement processing system includes a requisition and order management module that helps organizations streamline the requisitions process in the organization. The requisition and order management module allows users to request multiple items from different suppliers or a single requisition from a plurality of back-end resource servers on the Internet and transforms the content into a format suitable for delivery to the purchasing requisitioner. In one embodiment, an Extensible Markup Language (XML) content is formatted to transform the XML content from an external source into an appropriate markup content for delivery to a request from a user of the e-procurement system of the present invention.

The present invention further includes a Document Exchange Framework that allows multiple documents to be delivered at multiple locations based on a single requisition request by a user. The Document Exchange Framework allows the e-procurement system of the present invention to automatically process inbound and outbound XML document requests handled by the e-procurement system.

Embodiments of the present invention are directed to a system and a method for accepting in-bound order requests in a first data format from users and transmitting out-bound orders in a second data format substantially different from the first data format. The document framework of the present invention is further utilized to accept communications from the formatting and presentation logic in the electronic purchasing and procurement environment of a business enterprise. In general, embodiments of the present invention vary the degree of handling supplier or buyer requests in a plurality of purchase orders or requisitions from a plurality of web-based order catalogs in the electronic

Embodiments of the invention include an extensible markup language (XML) content generation and transformation solution. It is designed to improve the handling of "Open Buying on the Internet (OBI) Standard" content requests from a variety of user requisition requests to the procurement and purchasing system of the present invention. The requested information may be gathered from a variety of supplier catalogs over a variety of web-sites and integrated for presentation to a variety of different user requests. The present invention allows for the intelligent formatting of Internet based OBI standard language content requests to the purchasing and procurement system using one or more Internet access protocols available to the user. The data gathered is formatted into a coherent and cohesive content into one or more markup language documents suitable for delivery to the requesting user.

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modifying the underlying document exchange framework code. In one embodiment of the present invention, a Extensible Markup Language (XML) may be used to format content requests from the user to the purchasing and procurement system. The purchasing and procurement system then uses a sub-  
5 processing XDOC framework to generate XML data fetched and parsed in response to the user's request.

Embodiments of the present invention receive a user purchase requisition request from a particular user using an Internet based Open Buyer's Interface  
10 standard protocol. OBI is the standard used to connect multiple e-commerce sites together to provide real time data sharing between suppliers and purchasers. OBI allows multiple Internet sites to behave as one site.

Embodiments of the present invention generate out-bound documents in response to the in-bound requests from purchasers over the Internet. Out-bound  
15 documents are generated in XML which allows batched process data from on site to another. XML allows systems to be updated as data is passed back and forth from one system to another. The present invention allows the XML data to be configured to export and import data to the appropriate system on-demand,  
20 share real-time data between multiple sites and effectively keeps site data in synchronization.

A sub-process is used for formatting the requested data for presentation to the requesting purchasing requisitioner. In this embodiment, the present  
25 invention associates the contents of a purchase order to an arbitrary XML data source in a database associated with the e-procurement system. The retrieved XML data is transformed using a proprietary data object and attributes



transformation logic into an appropriate format such as a Hyper-Text Markup Language and a host of other markups languages.

5        These and other objects and advantages of the present invention will no  
doubt become obvious to those of ordinary skill in the art after having read the  
following detailed description of the preferred embodiments which are  
illustrated in the various drawing figures.

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## BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and form a part of this specification, illustrates embodiments of the invention and, together with the description, serve to explain the principles of the invention:

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Figure 1 is a block diagram of one embodiment of the e-commerce environment of the present invention;

10 Figure 2 is a block diagram of an embodiment of the architecture of the e-procuring and e-purchasing system of one embodiment of the present invention;

Figure 3 is a block diagram of an exemplary process flow implementation of a purchase requisition of an embodiment of the present invention;

15 Figure 4 is a block diagram of an exemplary data layout in memory and in a database of files in an embodiment of the present invention;

20 Figure 5 is a block diagram of an exemplary in-bound and out-bound document generation of one embodiment of the purchasing and procurement system of the present invention;

Figure 6 is a block diagram of an embodiment of the functional units of the XDOC unit of one embodiment of the present invention;

25 Figure 7 is a block diagram of an embodiment of the Extensible Markup Language (XML) data transformation unit of one embodiment of the present invention; and

Figure 8A and Figure 8B are flow diagrams of one embodiment of the XML data fetching and transformation processes in accordance with one embodiment of the present invention.

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## DESCRIPTION OF THE PREFERRED EMBODIMENTS

Reference will now be made in detail to the preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings.

While the invention will be described in conjunction with the preferred

embodiments, it will be understood that they are not intended to limit the invention to these embodiments.

On the contrary, the invention is intended to cover alternatives, modifications and equivalents, which may be included within the spirit and scope of the invention as defined by the appended Claims. Furthermore, in the following detailed description of the present invention, numerous specific details are set forth in order to provide a thorough understanding of the present invention. However, it will be obvious to one of ordinary skill in the art that the present invention may be practiced without these specific details. In other instances, well-known methods, procedures, components, and circuits have not been described in detail as not to unnecessarily obscure aspects of the present invention.

The invention is directed to a system, an architecture, subsystem and method to manage a extensible markup language content request formatting and presentation processes in a e-commerce procurement and purchasing environment in a way superior to the prior art. In accordance with an aspect of the invention, a e-procurement and e-purchasing system provides users content request formatting processes and presentation formatting processes that enables order requisition to be electronically processed on-line on the Internet.

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In the following detailed description of the present invention, a system and method for Internet protocol based communication system are described. Numerous specific details are not set forth in order to provide a thorough understanding of the present invention. However, it will be recognized by one skilled in the art that the present invention may be practiced without these specific details or with equivalents thereof.

Generally, an aspect of the invention encompasses providing an integrated e-procurement and e-purchasing system which provides a wide range of order requisition, process, acknowledgement and other services to online users who may connect to an enterprise on-line purchasing and requisition system.

Figure 1 depicts an e-commerce procurement and purchasing environment of one embodiment of the present invention. The on-line purchasing and procurement environment 100 shown in Figure 1 comprises computer server 110, e-Purchase and e-Procurement system 120, Interface 130, Database 140, Directory 150 and Memory 160 coupled a common communication channel.

Server 110 is coupled to provide a e-platform application server for the e-procurement and e-purchasing environment of the present invention. Server 110 provides a user a single sign-on facility to the e-Procurement system 120 of the present invention, as well as the ability to customize the e-Procurement system 120. Server 110 also provides scalability and high availability to the user.



data is stored in database 140 in the form of data objects with associating data attributes.

In the e-Procurement system of the present invention, Database 140 provides an intermediary storage facility of catalog information where orders  
5 originated by a user are stored. In-bound orders are processed by e-Procurement system 120 using order information retrieved from the catalogs stored in database 140. The e-Procurement system 120 transmits out-bound order documents based on available catalog information from a supplier to the buyer.

10 Directory 150 ("LDAP") is coupled to the e-Procurement system 120 to store membership information of users of the e-Procurement system 120. Directory 150 also stores information on the suppliers, as well as location information of buyers and seller in order to facilitate an effective and efficient communication of order and supply information between enterprises.

15 Memory 160 is coupled to the server 110 to store transient copies of purchase requisitions stored in database 140. A purchase order requisition of catalog information stored in memory 160 has a one-to-one correlation with data objects stored in database 140. Information stored in memory 160 are stored as  
20 data objects or the like in a manner well known in the art.

Referring now to Figure 2, a block diagram of one embodiment of the e-Procurement system 120 of the present invention is shown. As shown in Figure 2, e-Procurement system 120 comprises Catalog managing module 200, Catalog  
25 pricing module 210, Document Exchange (XDOC) module 220 and rule engine module 230. Also shown in Figure 2 is DOC Interface module 130 which is coupled to XDOC 220.





Procurement system 120 and the corresponding out-bound order data. The e-Procurement system 120 generates XML documents for completing in-bound and out-bound transactions to suppliers, etc. XDOC 220 examines the tags of any incoming document to the e-Procurement system 120 and determines whether a corresponding object to the tag is stored in Database 140. If the incoming document tag has a corresponding database data object, XDOC 220 populates the incoming requests with the attributes that correspond to the identified object tag. For example, an incoming document may have a tag in the incoming XML file such as <billing address>.

This tag is defined by the present invention as a data object as <bill to> in Database 140. Upon identifying the <billing address> tag, XDOC 220 immediately associates the tag with the <bill to> data object in Database 140 and subsequently populates the attributes associated with the <bill to> object. In the present invention, XDOC 220 has the flexibility to write out XML files in different formats. The files can be in "Opening Buying on the Internet (OBI) Standards" compliant format or non-OBI formats depending on how the business rules are set up.

Still referring to Figure 2, Rules module 230 is coupled to XDOC 220 to provide the underlying business rules that control the operating transaction principles of the e-Procurement system 120. In the present invention, Rules module 230 is configurable with generalized statements that allow system administrators to control the flow and behavior of e-procurement and purchasing system 120. The underlying business rules semantics are not as complex as a full programming language and therefore allow the user to perform typical customizations such as page layouts, icon layouts and other "click and

surf" functions typical in Internet computing without requiring any programming experience.

Figure 3 is a block diagram depiction of an exemplary process flow of the Open Buying on the Internet (OBI) standard which is the underlying standard utilized in Interface 230. The process flow shown in Figure 3 illustrates the interaction of these entities: requisition 310, Buying 320 and Supplier 330.

Requisition 310 is the user with a need for a product or service, who meets this need by querying the Supplier 330 catalogs for the required items. The Requisition 310 generates order requests and querying order status to the e-Procurement system 120 using an Internet browser.

Buyer 320 represents a purchasing management and information system which supports purchasing and procurement within an enterprise. These systems include an OBI server for receiving OBI order requests and retrieving OBI orders. The system further includes handling a requisition profile information, trade partner information and other information necessary to complete an order. The Buyer 320 also negotiates and maintains a contractual relationship with the Supplier 330.

Supplier 330 maintains a dynamic electronic catalog that represents accurate product and price information that can be tailored based on the organization's affiliation of the requisitioner 310. Product and price information reflects the contract with a buyer. The supplier's catalog must be integrated effectively with the inventory and order management system and an OBI server for sending OBI order requests and receiving OBI orders.

Figure 4 is a block diagram illustration of an exemplary data structure layout of files and data objects of one embodiment of the e-Procurement system 120 of the present invention. As shown in Figure 4, the file structure of the e-Procurement system 120 comprise requisition 400, line groups 410 and lines 420 which represent files structure stored in Memory 160.

The e-Procurement file system structure further comprise requisition 400b, line group 410b and line 420b which represent data objects which are stored in Database 140 and map to files in the file structure stored in Memory 160. In the present invention, line objects describe line item entries, such as the description of an item being purchased, the quantity, the location of the buyer or the supplier, etc., in a purchase order that specify the order by a buyer or response to an order from a supplier respectively. And each line object has attributes which define for example the purchase number, the expiration date of the order, the creation date of the order, the modification date of the order, etc.

Requisition 400 and the corresponding data objects requisition 400b represent an electronic list of items a buyer has. A requisition is a purchase request that has not yet been approved as a purchase order. In the present invention, Requisitions 400 and 400b include templates that can be used to create another requisition. The template can contain actual items that are repeatedly ordered or other types of information such as default billing, shipping and approval information.

Line group 410 and the corresponding data objects 410b represent groups of line items that have an association and are contained in a number purchase

requisitions which indicate the type of items that a buyer orders or a supplier has available for sale. Line groups form a number of requisitions may include, for example, Invoice line numbers, Order codes, Order line item number, etc.

- 5           Lines 420 and the corresponding data objects lines 420b represent the line items contain in each purchase requisition. As shown in Figure 4, each line in memory maps to a data object line in Database 130. Also, each line in either Memory 160 or Database 140 maps to a line in Line group 410 and 410b respectively. In the present invention, line groups and lines are data items which
- 10       are stored in Database 140 as data objects and data attributes.

- Although the data objects and attributes may differ, the document transformation logic of the present invention relates the data object and attributes in a manner that enables the XDOC 220 to retrieve data in a relational
- 15       manner when exact information of a purchase requisition is not found in the Database 140. The function and method of the file layout in Database 140 and Memory 160 is described in U.S. patent application titled "Dynamic Criteria Based Line-Grouping Mechanism and Method for Purchase Order Generation", filed on \_\_\_\_\_, Serial No.: \_\_\_\_\_, attorney docket number SUN-P6514,
- 20       assigned to the assignee of the present invention and hereby incorporated by reference herein.

- Figure 5 is block diagram depiction of one embodiment of the XDOC framework 220 of the present invention. As shown in Figure 5, the Framework
- 25       220 comprises Processing Unit 500, in-bound documents 510 - 530 and out-bound documents 540-560.

Processing Unit 500 comprises XML processing logic for automatically processing order requests and responses in XML or other applicable markup languages for purchase requisitions made via the e-Procurement system 120 of the present invention.

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Process unit 500 generates XML documents for sending out order requests to suppliers by buyers or procurement professionals. Processing unit 500 also handles in-bound request documents (e.g., 510 - 530) originating from suppliers responding to order requests from buyers using the e-Procurement system 120 of the present invention. The Processing Unit 500 uses a documents exchange logic to automate the processing of in-bound request documents which are typically OBI compliant XML files. The Processing Unit 500 further generates out-bound documents by relating file information contained in the in-bound and out-bound documents to data objects and attributes retrieved from database 140 based on the prior knowledge of the user's purchasing characteristics.

Still referring to Figure 5, the in-bound documents comprise documents 510 - 530 which typically represent an "OBI 855" document (in one embodiment) for handling order acknowledgements from a supplier, "OBI 856" documents which typically handle advance shipping instructions from the supplier to the buyer indicating when goods ordered by the buyer may be delivered. The in-bound documents further include "OBI 865" documents (in one embodiment) which typically represent order cancellation acknowledgements from the supplier to the buyer acknowledging receipt of an order cancellation by the buyer.



5 The Configuration File module 600 also provides a mechanism for the e-Procurement system 120 to define the relationship between data objects and attributes in the purchase requisition process of one embodiment of the invention. The Configuration File module 600 defines the tables in database 140 in a tree structure to allow the XDOC 220 to retrieve related objects by recursively traversing the data object file layout in the Database 140.

10 POF 610 is coupled to the Configuration File module 600 to provide a way of handling data objects in Database 110 and maintain the persistency of these data objects. The data objects are provided to Conduit module 620 which is coupled to the Configuration File module 600 which determines how the data objects may be processed. The Conduit Module 620 also identifies the attributes of the data objects and corresponding attributes that may relate to the particular data object.

15 Figure 7 is a block diagram of one embodiment of the Conduit module 620 of the present invention. As shown in Figure 7, Conduit module 620 comprises GETXML module 700, XML Translator 710, XML Reader 720 and POF Object Generator 730.

20 GETXML module 700 is coupled to receive external OBI XML files from an external source ( e.g., Buyer or Supplier). The external OBI XML file includes the various tags identifying the various purchase order parameters specified by the buyer or supplier to identify goods or service purchasing transaction  
25 processed by the e-Procurement system 120 of the present invention. The parameters may be buyer or supplier specific or generic to every user of the e-Procurement system 120.





defines which tables, lines, line groups may be related in the Database 140. For example, a line group comprises several lines with each line defining specific items (e.g. ship-to-location, bill-to-location, etc.) in the purchase order.

5 In an embodiment of the present invention, attributes of a specific data object can be selectively written out during an XDOC processing of a document. A user may also specify the purchase order processing to custom-property for relationships. This allows, for example, the write-out of line objects associated with a line group when the line group is written out. The XDOC process also  
10 allows the user to selectively retrieve specific attributes of a line object without retrieving all the objects associated with the particular line.

Figure 8A and Figure 8B represent a flow diagram depiction of an exemplary process flow in accordance with one embodiment of the processing of  
15 inbound and outbound documents respectively of the present invention. The steps performed by the diagrams of Figure 8A and Figure 8B are performed by a computer system processor executing memory stored instructions which make up a program or application.

20 As shown in Figure 8A, the processing of inbound documents is initiated at step 800 when the XDOC framework module 220 receives inbound purchase orders from a requisition entity. At step 810, the XDOC framework module 220 parses the inbound XML file to identify the contents of the file. At step 820, the XDOC framework module 220 extracts the tag names contained in the XML file  
25 and creates data objects based on the tag names.

At step 830, the XDOC framework module 220 generates a data object tree structure by identifying associating related objects to the data object created in step 820. The tree structure generated by the XDOC framework 220 is then saved in a relational database format using the persistent object framework of an embodiment of the present invention in database 140 at step 840.

Outbound document processing commerce at step 850 with the presentation of one data object as the identifying characteristics of a particular purchase order at step 860.

At step 870, the XDOC framework 220 traverses the object tree structure in Database 140 using the relationship between the identified object and other data objects stored in database 140. As the XDOC framework 220 traverses the data object tree structure, like or otherwise related objects are retrieved and automatically transformed into XML files which are then sent to the Configuration file 600 at step 880.

At step 890, the retrieved related object data is customized by the user in the Configuration file 600 which therefore saves the e-Procurement system from recompiling the configuration code again. Processing of the outbound documents generation terminates at step 895 when the XML output file is sent to the requesting entity.

The foregoing descriptions of specific embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light

of the above teaching. The embodiments were chosen and described in order to best explain the principles of the invention and its practical application, to thereby enable others skilled in the art to best utilize the invention and various embodiments with various modifications are suited to the particular use

- 5 contemplated. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

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